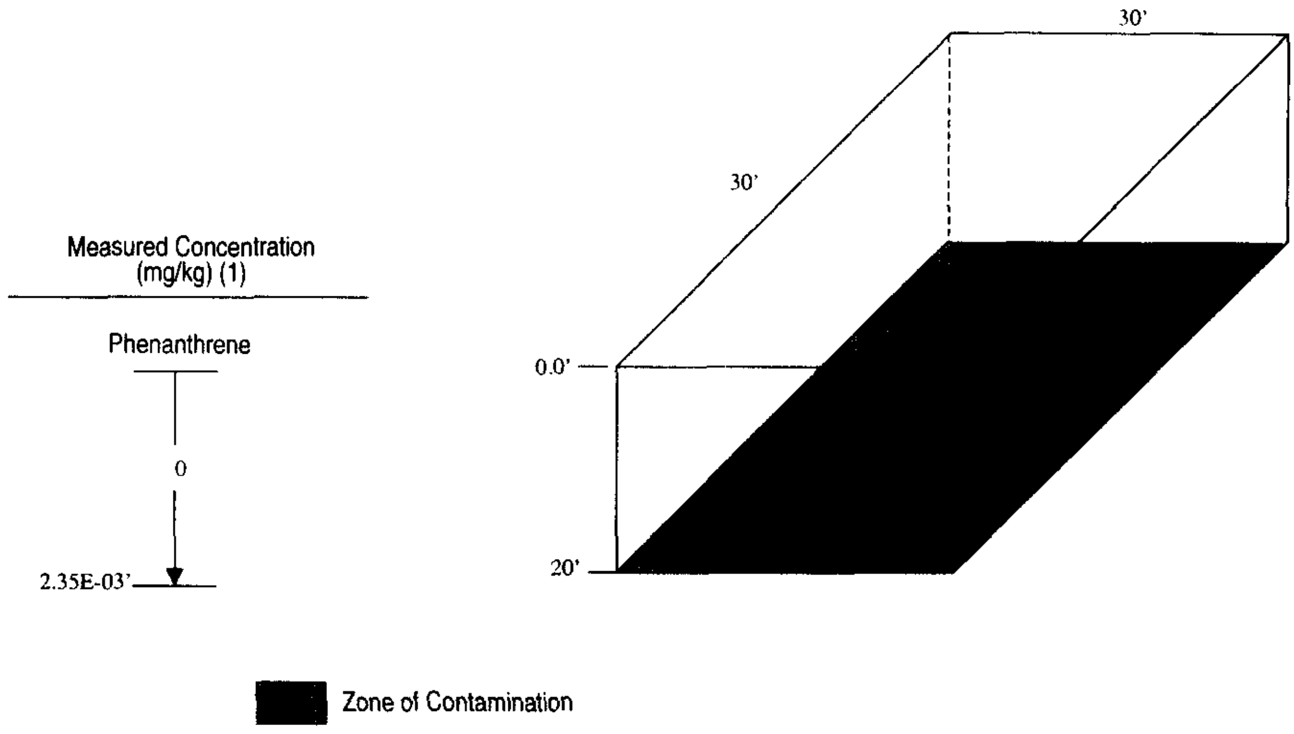


Receptors/Pathways and Calculated Exposure Point Concentrations			
Receptor/Pathway	Units	**Depth (ft)**	**Phenanthrene**
Occupational / Air	mg/Kg	0 - 0.5 (1)	0.00E+00
Occupational / External Radiation	mg/Kg	0 - 4 (2)	0.00E+00
Residential / All	mg/Kg	0 - 10 (2)	0.00E+00
Residential / Groundwater	mg/Kg	20 (3)	2.66E-03

Assumptions:
Site was excavated to 7.3 m (24 ft) and backfilled, but positive chemical detections are reported at 6.1 m (20 ft.). The assumed maximum depth of contamination (i.e., 6.1 m [20 ft]) is based on positive detections of COPCs in the vadose zone no deeper than 6.1 m (20 ft). It is assumed that COPCs will not migrate downward beyond 6.41 m (20 ft) due to the presence of basalt at 6.1 m (20 ft).

Notes:
(1) Exposure point concentrations shown for this depth interval represent the 95% lognormal UCL (95 UCL) or maximum detected concentration, whichever is less, for analytical data collected at the site.
(2) Exposure point concentrations (EPC) shown for this depth interval represent volume-weighted concentrations, and are calculated using the following equations:

Depth (ft)	EPC Equation
0-4	$[(C_{0-0.5})(0.5) + (C_{0.5-4'})(3.5)]/4$
0-10	$[(C_{0-0.5})(0.5) + (C_{0.5-4'})(3.5) + (C_{4'-10'})(6)]/10$
20	$C_{>10'}$

Where: C=95 UCL or maximum detected concentration, whichever is less, for the indicated depth interval.

COPCs are only detected at 6.1 m (20 ft) bgs. Therefore, exposure point concentrations for the residential groundwater pathway are based on measured concentrations at 6.1 m (20 ft) bgs.

Figure 4-23. OU 4-09: CFA-42 nature and extent assumptions.

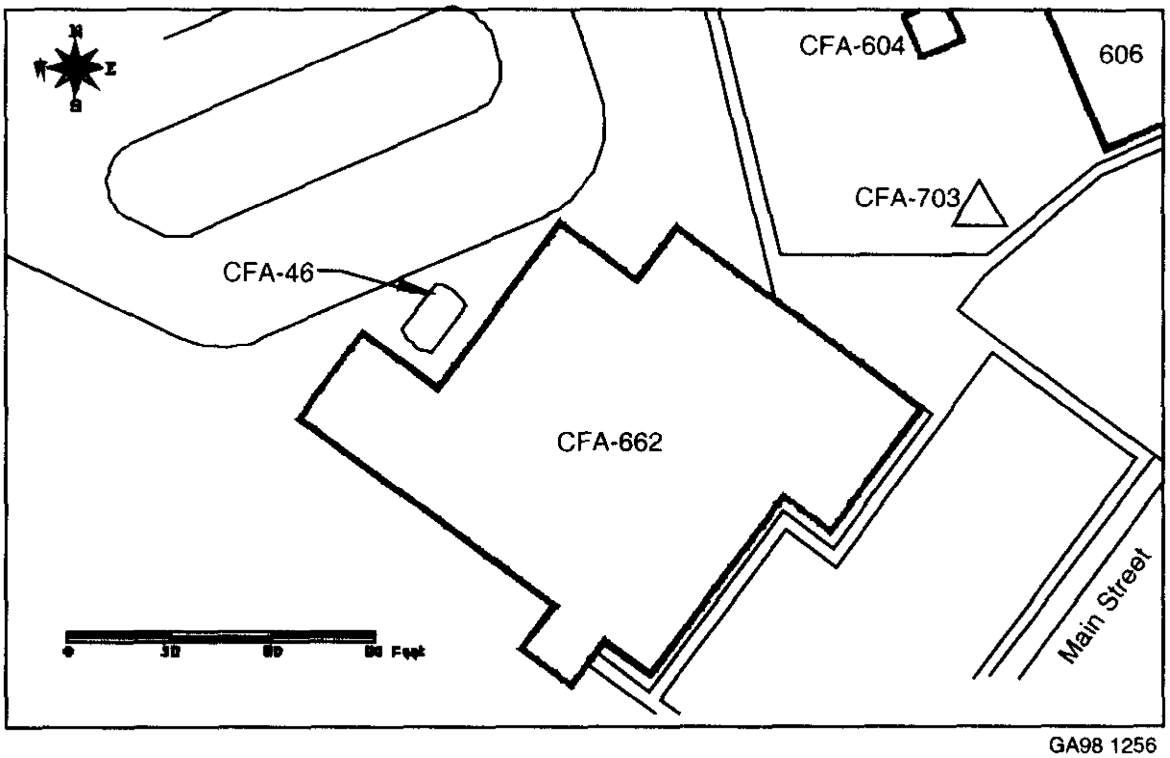


Figure 4-24. OU 4-09: CFA-46 Cafeteria Oil Tank Spill (CFA-721).

4.1.15.2 Previous Investigations. The CFA Motor Pool Pond (OU 4-11) was investigated in 1989 to support a RCRA closure plan. These data were later evaluated in the OU 4-11 RI/FS (Spry et al. 1992) and were the basis of a Record of Decision (DOE 1992). The scope of the RI was limited to surface sediments and did not include characterization of the subsurface geology or groundwater. As stated in Section 1.1 of the OU 4-11 RI/FS, "the potential for groundwater contamination as a result of past waste disposal practices, and the potential for exposures to contaminated groundwater, would be evaluated in a future investigation." The investigation consisted of collection of 41 soil samples from sediments in the pond and along the inlet ditch. Thirty-eight of the samples were analyzed for gamma-emitting radionuclides and three for alpha-emitting radionuclides. Four of the samples were analyzed for metals and VOCs.

4.1.15.3 Nature and Extent of Contamination. Analytical data from the investigation indicate that metals are present in the sediments above background concentrations. These include barium; 92.4 to 434, beryllium; 0.22 to 1.4 mg/kg, cadmium: 0.53 to 38.8 mg/kg, chromium; 8.2 to 91.3 mg/kg, lead; 10.6 to 631 mg/kg, mercury; 0.06 to 1.2 mg/kg, and thallium; 0.3 to 1.0. The highest concentrations of metals were found in the sediments along the ditch from 0 to 2 m (0 to 7 ft) in depth, and in sediments along the ditch. The VOC data indicate that four compounds (acetone - 90 ug/kg, 2-butanone – 40 ug/kg, 4-methyl 2-pentanone – 40 ug/kg, methylene chloride – 40 ug/kg, and tetrachloroethylene – 76 ug/kg) were detected at a depth of 4 m (13 ft) in the pond sediments. Aroclor-1260 was detected in sediments near the outlet pipe at a concentration of 1,470 ug/kg. Radionuclides (Am-241 - 2.72 pCi/g, Cs-137 - 8.4 pCi/g, and Pu-239 - 4.29 pCi/g) were detected in surface sediments of the ditch and pond.
The OU 4-11 BRA for the site indicates that the potential risks to human health are within the acceptable risk range for future residential exposure pathways and consequently, the ROD documents a "no further action decision."

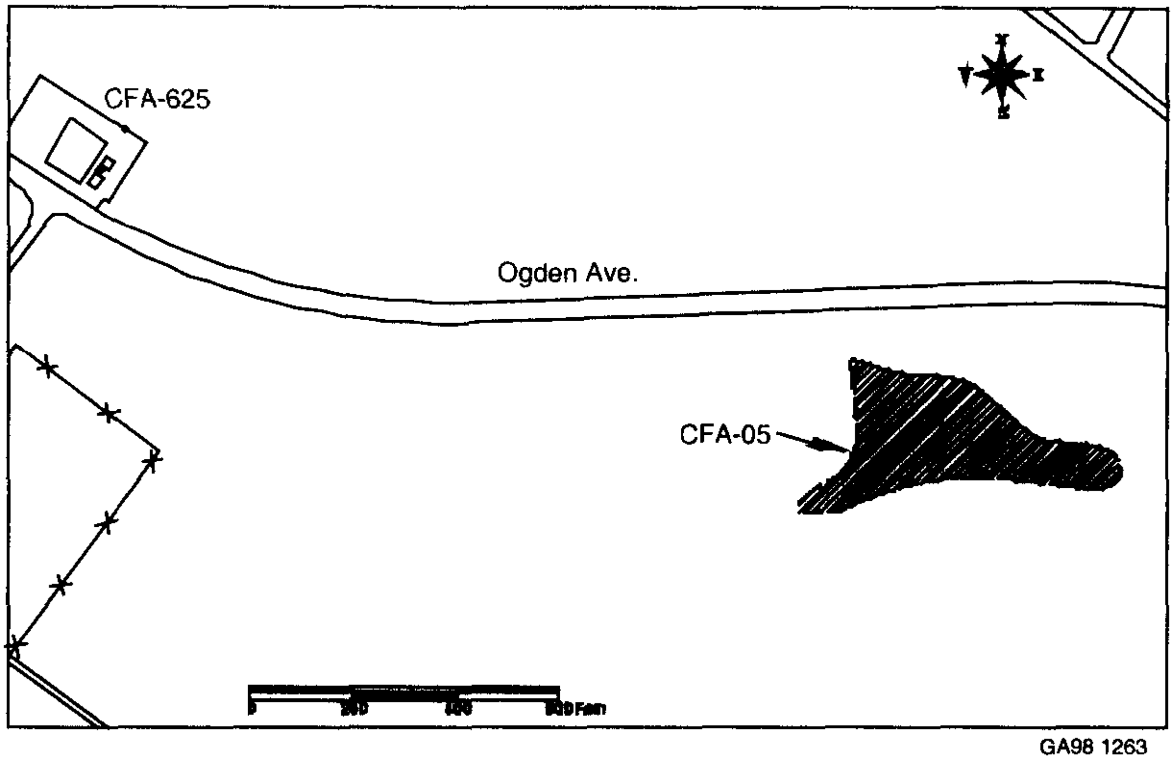


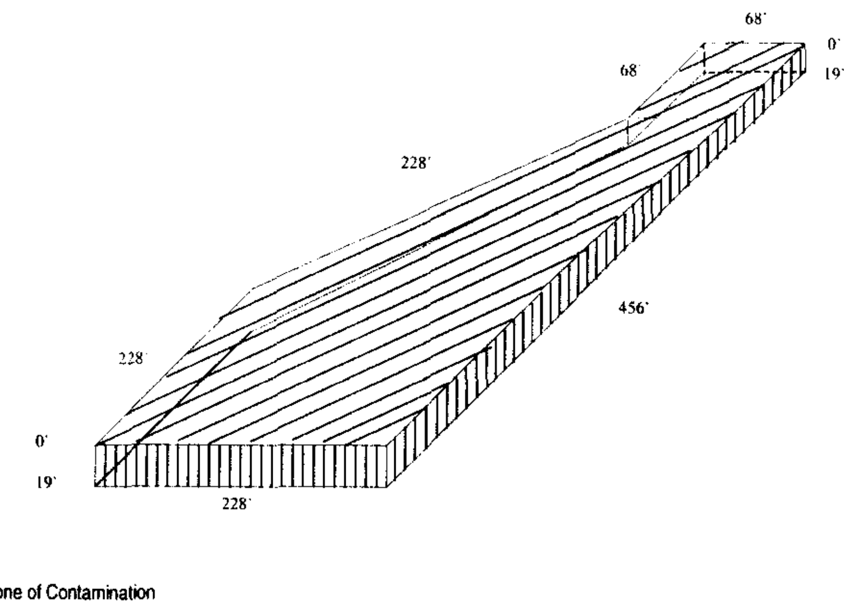
Figure 4-25. OU 4-11: CFA-05 Motor Pool Pond.

These data from the investigation were evaluated in a supplemental contaminant screen to determine the groundwater COPCs for the groundwater exposure pathway. The results of the screen are presented in Table C-41 of Appendix C. The summary statistics for COPCs are shown in Tables C-42 and C-43, Appendix C. The COPCs retained for the groundwater risk evaluation are: Aroclor-1260, Ac-228, Am-241, arsenic, Bi-212, Bi-214, Cs-137, lead, Pb-212, Ra-226, and Tl-208. Figure 4-26 shows the source term estimates used to evaluate risk associated with the groundwater pathway in Section 6 of this BRA.

4.1.16 OU 4-13: CFA-51 Dry Well at North End of CFA-640

4.1.16.1 Site Summary. This site is a former small dry well located at the north end of Building CFA-640 (see Figure 4-27). The dry well was discovered on December 13, 1995 during excavation of the building's water lines as part of CFA-640 D&D Program activities. The site was added to the FFA/CO due to the potential release of contaminants.

The dry well was constructed from a short section of clay sewer pipe set vertically in the ground. The pipe was approximately 0.46 m (1.5) ft in diameter, 0.61 to 0.91 m (2 to 3 ft) in length, with a round steel cover at the ground surface. A smaller buried pipe connected the dry well to CFA-640. The source of potential contamination within CFA-640 was a floor drain in the building, which served a garage area for vehicle repair and parking. The floor drain was covered when the garage was modified for other uses.



Receptors/Pathways and Calculated Exposure Point Concentrations				
Receptor/Pathway	**Units**	**Depth (ft)**	**Lead**	**Aroclor-1254**
Occupational / Air	mg/Kg	0 - 0.5 (1)	2.61E+02	1.01E+00
Occupational / External Radiation	mg/Kg	0 - 4 (2)	1.61E+02	3.36E-01
Residential / All	mg/Kg	0 - 10 (2)	1.07E+02	1.34E-01
Residential / Groundwater	mg/Kg	0 - 19 (2)	6.37E+01	7.07E-02

Receptors/Pathways and Calculated Exposure Point Concentrations										
Receptor/Pathway	**Units**	**Depth (ft)**	**Ac-228**	**Am-241**	**Bi-212**	**Bi-214**	**Cs-137**	**Pb-212**	**Ra-226**	**Tl-208**
Occupational / Air	PCi/g	0-0.5 (1)	1.31E+00	9.46E+00	1.46E+00	1.27E+00	8.41E+00	1.36E+00	2.93E+00	1.29E+00
Occupational / External Radiation	PCi/g	0-4 (2)	1.32E+00	2.31E+00	1.53E+00	1.24E+00	2.50E+00	1.31E+00	2.66E+00	1.27E+00
Residential / All	PCi/g	0-10 (2)	1.37E+00	9.25E-01	1.17E+00	1.09E+00	1.00E+00	1.42E+00	2.35E+00	1.27E+00
Res (3) – Groundwater	PCi/g	0-30 (2)	1.37E+00	9.25E-01	1.17E+00	1.09E+00	9.76E-01	1.42E+00	2.35E+00	1.27E+00
Residential / Groundwater	PCi/g	0-30 (2)	1.21E+00	4.87E-01	1.18E+00	9.76E-01	5.27E-01	1.24E+00	2.00E+00	1.13E+00

Assumptions:
The assumed maximum depth of contamination (i.e., 5.8 m [19 ft]) is based on positive detections of COPCs in the vadose zone no deeper than 5.8 m (19 ft). It is assumed that COPCs will not migrate downward beyond 5.8 m (19 ft) due to the presence of basalt at 5.8 m (19 ft).

Notes:
(1) Exposure point concentrations shown for this depth interval represent the 95% lognormal UCL (95 UCL) or maximum detected concentration, whichever is less, for analytical data collected at the site.
(2) Exposure point concentrations (EPC) shown for this depth interval represent volume-weighted concentrations, and are calculated using the following equations:

Depth (ft)	EPC Equation
0-4	$[(C_{0\text{-}0.5})(0.5) + (C_{0.5\text{-}4'})(3.5)]/4$
0-10	$[(C_{0\text{-}0.5})(0.5) + (C_{0.5\text{-}4'})(3.5) + (C_{4'\text{-}10'})(6)]/10$
0-19	$[(C_{0\text{-}0.5})(0.5) + (C_{0.5\text{-}4'})(3.5) + (C_{4'\text{-}10'})(6) + (C_{>10'})]/19$

Where: C=95 UCL or maximum detected concentration, whichever is less, for the indicated depth interval.

Figure 4-26. OU 4-11: CFA-05 nature and extent assumptions.

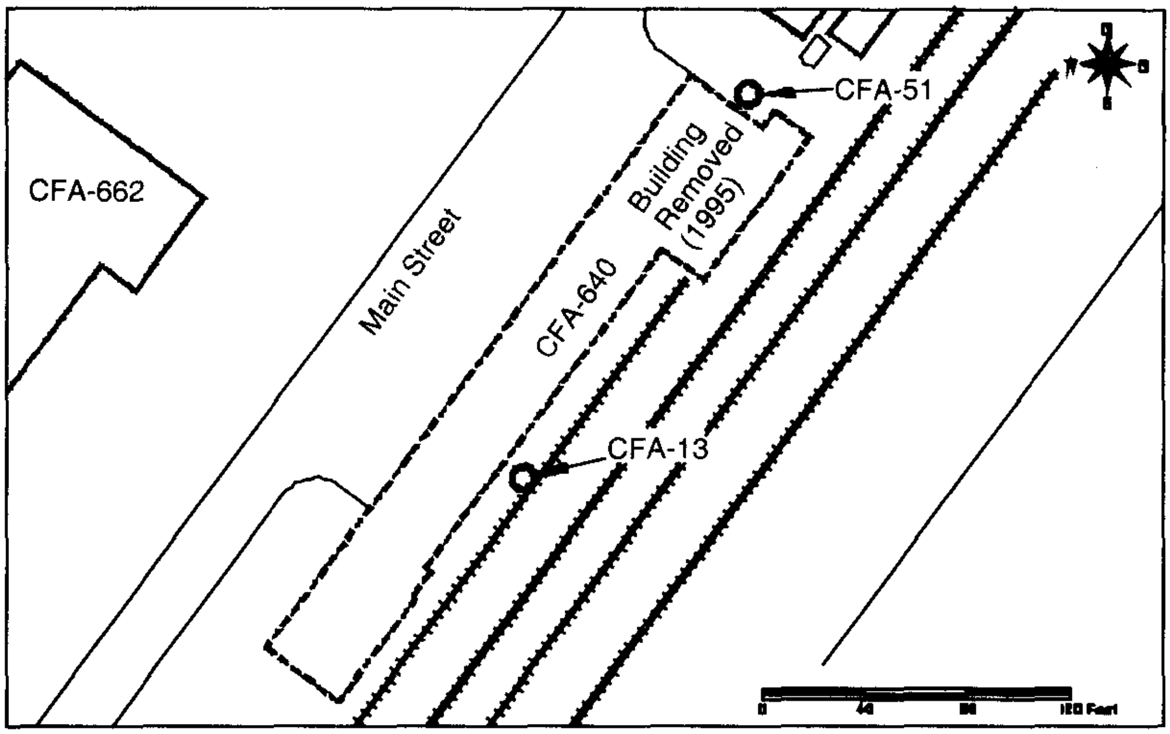


Figure 4-27. OU 4-13: CFA-51 Dry Well at North End of CFA-640.

4.1.16.2 Previous Investigations. A radiological survey was performed when the dry well was discovered to determine the potential for radiological contamination inside and around the dry well. Alpha radiation was detected on the clay pipe during the survey and was assumed to be a result of thorite, a constituent of the clay pipe. A soil sample was collected from the bottom of the dry well. The sample was analyzed for PCBs, inorganics, and SVOCs. VOC analysis was not performed because process knowledge indicated that contamination would be detected by analysis for SVOCs, which are more persistent in the environment. Summary statistics for CFA-51 are presented in Table C-45. Evaluation of the analytical data in the initial contaminant screen presented in the RI/FS Work Plan identified lead as a COPC. The supplemental contaminant screen presented in Table C-44 and C-45, Appendix C, indicates that lead is below the EPA (1994) 400 mg/kg screening level, and does not require further evaluation.

4.1.16.3 Nature and Extent of Contamination. Based on the supplemental contaminant screen, no further evaluation is necessary at the site and CFA-51 is eliminated from further consideration in the BRA.

4.1.17 OU 4-13: CFA-52 Diesel Fuel UST (CFA-730) at Building CFA-613 Bunkhouse

4.1.17.1 Site Summary. The CFA-52 site consists of a 1,893-L (500-gal) UST used to store diesel fuel for heating Building CFA-613 (Figure 4-28). The tank was installed in 1950, abandoned in 1995, and removed in 1996. During tank removal activities, stained soil was observed in the bottom of the excavation, indicating that the tank had leaked. Small holes were also observed in the tank itself. As a result of the release of diesel fuel, the site was added to the FFA/CO.

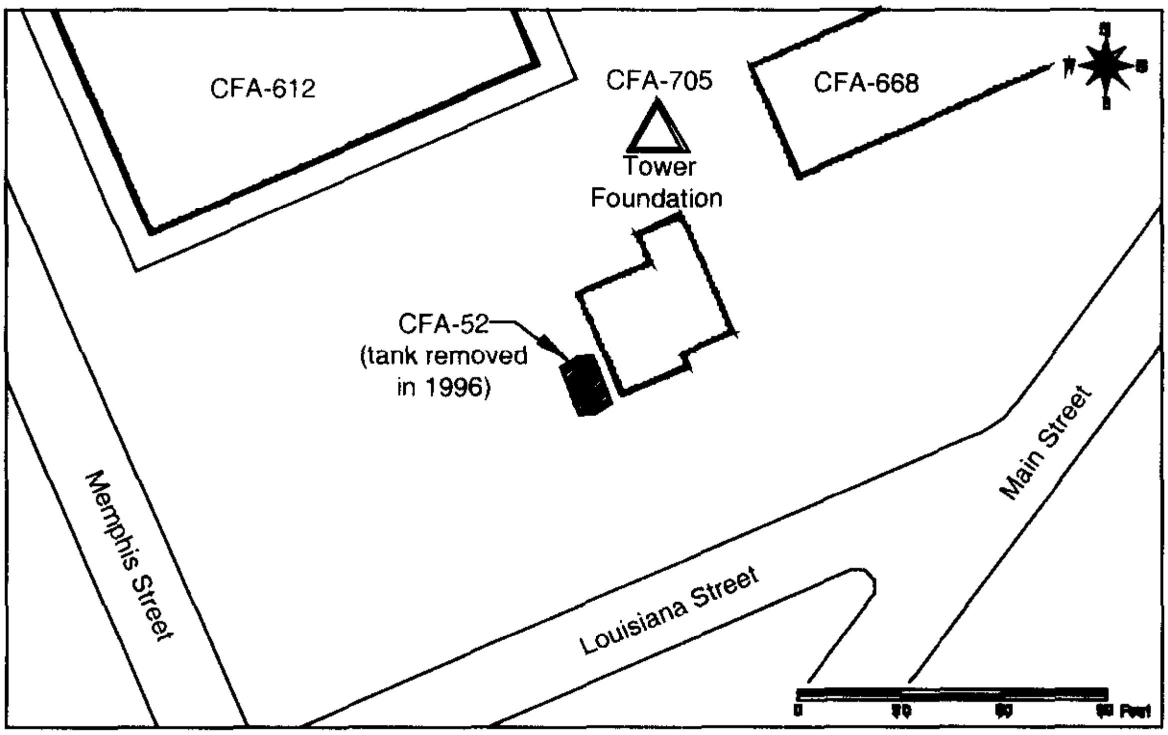


Figure 4-28. OU 4-13: CFA-52 Diesel Fuel UST (CFA-730) at Bldg. CFA-613 bunkhouse.

4.1.17.2 Previous Investigations. The tank was removed in April 1996 along with soil contaminated with TPH at concentrations greater than 1,000 mg/kg. Approximately 22.9 m^3 (30 yd^3) of soil was removed to a depth of approximately 4.9 m (16 ft) when bedrock was encountered. Soil samples were collected from the bottom of the excavation and analyzed for TPH and VOCs. Three contaminants, 1,1,1-trichloroethane, TPH, and tetrachloroethene, were detected. Maximum detected concentrations of these chemicals (0.008 mg/kg, 578 mg/kg, and 0.026 mg/kg, respectively) were below respective residential soil risk-based screening concentrations of 24,300 mg/kg, 1,000 mg/kg, and 12.3 mg/kg. As a result, these contaminants were screened from further evaluation in the Work Plan.

4.1.17.3 Nature and Extent of Contamination. All contaminants at CFA-52 were eliminated in the contaminant screening presented in the Work Plan. As a result, supplemental screening was not performed. The potential exists for contaminant migration to groundwater; therefore, CFA-52 is included in Section 6 to assess cumulative risk to groundwater.

4.2 CFA Facilities Analysis

4.2.1 Introduction

This section presents the results of the WAG 4 facilities analysis. A facility is defined as any building or structure. Many of the facilities at CFA are located near WAG 4 release sites identified in the FFA/CO. This analysis includes a review of all operational, abandoned, and demolished facilities with respect to their potential impact on the cumulative risk posed by WAG 4.

The original facilities at CFA were built in the 1940s and 1950s to house the Naval Gunnery Range and associated personnel. The Fire Station #2 Training Facility was built in 1952. Most of these buildings were demolished by the D&D program. The gun range facility is also included in this evaluation. Facilities at CFA have been modified over the years to fit the changing needs of the INEEL and now provide four major types of functional space; craft, office, service, and laboratory. The primary structures and buildings at CFA are grouped into these general categories. A list of all CFA facilities and associated uses is provided in Appendix E.

Craft Shops. The Multi-craft Shops (CFA-621, -622, -623, and -624) house shops for machining, carpentry, electrical repair, mechanical maintenance, sheet metal fabrication, painting, lock-smithing, janitorial, signs, offices, and power line services. The crafts housed at this complex support operations at other INEEL facilities.

Offices. Buildings at CFA that are primarily used for offices are CFA-614, -615, -627 through -631, -689, and -1610. Office space is also provided in portions of other buildings.

Services. Medical services are provided at building CFA-1612 constructed and occupied in 1996. The facility provides space for industrial medical programs, treatment of illnesses and injuries, health education, and emergency medical response. The facility is equipped with a treatment and decontamination facility for management of radioactively-contaminated patients. The original medical facility was housed in building CFA-603 built in 1950, and remodeled in 1981. This facility is now inactive.

Food services are provided in the cafeteria, building CFA-662. The building was built in 1963 and is still in use.

Vehicle maintenance and transportation services are provided by several facilities at CFA. The Bus Depot (CFA-685), built in 1952, is the primary stopping point for INEEL buses traveling to and from surrounding communities. The depot also houses the dispatch office for INEEL taxi and shuttle bus services, as well as the mail service. The transportation Facility (CFA-696) houses bus and equipment maintenance operations. This facility was constructed in 1995 and replaces building CFA-665, the Equipment Repair Shop. CFA-665, built in 1951 was demolished in 1997.

The Helicopter Security and Maintenance Facility (CFA-608), built in 1984, housed INEEL security personnel, helicopters, and equipment until 1996. The building is currently used for excess computers and equipment.

Fire Station No. 1 (CFA-1611) houses the INEEL Fire Department Headquarters, fire fighting equipment, personnel, training areas, and offices. The building was constructed and occupied in 1996. The former fire station was located in building CFA-666.

Warehouses located in buildings CFA-601, -614, and -674 are used for storage of stock inventory and records, receipt/distribution operations, excess property disposal, and offices.

Laboratories. The Radiological and Environmental Sciences Laboratory (RESL) (CFA-690), built in 1963, houses laboratories for dosimetry monitoring. Radiological reference standards are also stored at the facility for INEEL and off-site use. The laboratory conducts ecological monitoring, such as sampling and analysis of soil, water, plants, and animals. The U.S. Geological Survey offices are also housed in CFA-690.

The Laboratory Complex (CFA-625), built in 1989, provides analytical laboratory space for analysis and research. The majority of the work conducted in the laboratories involves non-radiological materials; however, some of the laboratory space is equipped to handle materials that contain radioisotopes.

The Standards and Calibration Laboratory (CFA-698), houses a laboratory where calibrations are performed.

The Office Building and Environmental Laboratory (CFA-612), built in 1983, provides offices, classrooms, and laboratories for the analysis of drinking water and air samples collected at the INEEL.

The Health Physics Instrumentation Laboratory (CFA-633), built in 1950 and remodeled in 1981, provides support for the calibration and use of radiological instrumentation at other INEEL facilities. Radiological materials associated with monitoring equipment may be handled in this facility.

4.2.2 Screening of WAG 4 Facilities

The screening process for CFA facilities included all operational buildings and structures, those no longer being utilized for their original mission, and those that have been abandoned or demolished. Past and current uses of these facilities were investigated to determine whether or not contamination has occurred resulting in a site that was not identified in the FFA/CO, and if there is a potential unacceptable risk associated with the facility. A facility, for purpose of this analysis, is any building or structure. All CFA facilities were eliminated from further consideration, as a result of the screening process, and require no further evaluation or remedial action. The results of the facilities screening is presented in Appendix E.

The screening criteria are discussed below. A facility was eliminated from further consideration if:

1. It is a site assigned to an existing OU in WAG 4 under the FFA/CO

2. It may have processed, stored, or utilized hazardous materials, but has no historical evidence based on process knowledge or specific sample data that a release to the environment has occurred or releases to the environment have been remediated.

3. It would not have processed, stored, or utilized hazardous materials/waste. These facilities would typically include: personnel offices, nonhazardous material storage areas, training/security buildings, personnel support buildings, nonhazardous liquid storage, water facilities, and electrically driven pumping facilities. Materials used in these facilities typically include the use of products that are distributed to the general public.

4. Discharges from the facility to the environment are permitted through other programs and/or are operated with appropriate management controls.

5. Data indicate that releases from tanks are less than the risk-based soil concentrations for BTEX and/or TPH.

4.2.3 CFA Management Controls

An integral part of the analysis was the review of management control procedures (MCPs) utilized to mitigate potential releases to the environment at CFA. The documents and procedures utilized to mitigate potential releases to the environment at CFA include: Safety Analysis Reports (SARs) for the nuclear facilities, RCRA Contingency Plans, Spill Avoidance and Response Plans, Emergency Plans Implementing Procedures, and Nuclear Materials Inspection and Storage Procedures. These procedures are designed to specifically address potential releases to the environment at CFA and the appropriate reporting and mitigation measures to be implemented in the case of such an event. In support of these MCPs are standard operating procedures that cover operational aspects of activities at CFA. These procedures are designed to eliminate or minimize the risk of off-normal events. In addition to CFA-specific MCPs, the site contractor has INEEL program requirements. These program requirements include physical hazards, asbestos control, and toxic substance control. The documents described above are discussed in the following sections.

4.2.3.1 Safety Analysis Reports for Nuclear Facilities. Department of Energy Order 5480.23, "Nuclear Safety Analysis Reports," requires a safety analysis to be performed for each DOE nuclear facility. The term nuclear facility is defined in this order to include nuclear reactor and nonreactor nuclear facilities, the latter to include "activities or operations that:

1. Produce, process, or store radioactive liquid or solid waste, fissionable materials or tritium.

2. Conduct separation operations.

3. Conduct irradiated materials inspection, fuel fabrication, decontamination, or recovery operations.

4. Conduct fuel enrichment operations.

5. Perform environmental remediation or waste management activities involving radioactive materials."

The order requires that, contractors perform a hazard analysis of their nuclear activities and classify their processes, operations, or activities in accordance with the following requirements:

- **Classification Categories**—The consequences of unmitigated releases of radioactive and/or hazardous materials shall be evaluated and classified by the following hazard categories:

  - Category 1 Hazard. The hazard analysis shows the potential for significant offsite consequences.

  - Category 2 Hazard. The hazard analysis show the potential for significant onsite consequences.

  - Category 3 Hazard. The hazard analysis shows the potential for only significant localized consequences.

- **Inventory of Hazardous Materials**—The hazard analysis shall be based on an inventory enveloping all radioactive and nonradioactive hazardous materials that are stored, utilized, or may be formed within the nuclear facility.

- **Evaluation of Potential Releases**—The hazard analysis shall identify energy sources or processes that might contribute to the generation or uncontrolled release of hazardous materials. The hazard analysis shall estimate the consequences of accidents in which the facility of process and/or materials in the inventory are assumed to interact, react, or be released in a manner to produce a threat or challenge to the health and safety of individuals onsite and offsite."

Safety analyses performed in compliance with these requirements contain inventories of potentially releasable hazardous materials. Also, such safety analyses include a listing of barriers to release, which are both physical and administrative, and a discussion of the accident types that might breach the barriers. Guidance is given in DOE standard DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports," on radioactive material inventory levels that would constitute the threshold of each Hazard Category. Although category thresholds are not defined for nonradioactive hazardous materials, the concepts of "localized," "onsite," and "offsite" consequences of a release are applied to those materials as well.

Nonnuclear facilities (those having no radioactive inventories or inventories below the category 3 threshold of DOE-STD-1027-92), DOE limited standard DOE-EM-STD-5502-94, "Hazard Baseline Documentation," gives documentation for various levels of hazardous materials inventories.

Most facilities and operations at the INEEL have a hazard analysis performed that identifies the hazards of the operation and helps initially categorize the facility or operation for further analysis according to the level of hazard established. Activities not included in this would be those whose hazards are obviously of a nature that is routinely accepted by the public (i.e., office work, warehouse, carpentry, welding, etc.). These activities comply with the requirement to maintain Materials Safety Data Sheets.

4.2.3.2 CFA Emergency Plan/RCRA Contingency Plan. The INEEL Emergency Plan/RCRA Contingency Plan contains the process for response to and mitigation of any consequences resulting from emergencies that may occur at the INEEL. This plan includes all federal, state, and local emergency plan requirements. It implements appropriate portions of 29 CFR and 40 CFR 264 and 265. This plan will be implemented in the event of fires, explosions, or any unplanned release of hazardous materials to the air, soil, surface and/or groundwater and is designed to minimize any consequences to human health and the environment from these events.

The CFA Spill Avoidance and Response Plan establishes general policy and responsibilities for spill avoidance and response requirements for operations at CFA. It is prepared in accordance with the INEL Environmental Compliance Planning Manual, Section 3.9.2 "Spill Avoidance and Response Plans," DOE Order 5400.1 (General Environmental Protection Program), DOE Order 5500 series (Emergency Preparedness), and 40 CFR 122.26 (National Pollutant Discharge Elimination System Storm Water Permit Regulations).

Facility operations at CFA that have the potential to release hazardous substances (listed in CFR Parts 116, 302, 355, and 372) or petroleum products to the environment, are required to implement the Spill Avoidance and Response Plan unless; (1) they are covered by a RCRA contingency plan, or (2) they store these substances in the same form and concentration as a product packaged for distribution and use by the general public.

4.2.3.3 Asbestos Control Program. An asbestos control program at the INEEL establishes mandatory standardized requirements for any asbestos-related work. This program is regulated by the Lockheed Martin Idaho Technologies Company (LMITCO) Program Requirements Document (PRD)-73, entitled Asbestos Control Program. This program lists the requirements of administrative responsibilities, surveillance, exposure and assessment, compliance methodology, and all other aspects of regulating asbestos at the INEEL. Currently, a database software program called HAZ CAD is being implemented at the INEEL to track asbestos-containing material per Federal Regulations.

4.2.3.4 Toxic Substances Control Act. The requirements for the use and disposal of PCBs at the INEEL are contained in the Environmental Manual, Number EM-A10 entitled Toxic Substances Control Act. Records of equipment containing PCBs, manifests of all PCB shipments to non-INEEL treatment, storage, and/or disposal facilities, and certificates of disposal are maintained at the INEEL. Records are updated annually in the "Annual Records and Document Log," which is submitted to DOE-ID by July 1 of each year. This is a LMITCO administrative requirement, as well as a 40 CFR 761.180(a) requirement.

As of October 1, 1985 the use of transformers containing PCBs was banned by Federal law if they posed an exposure risk to food and feed, otherwise they can remain in use until replacement is necessary. A transformer in use under these conditions must be registered with the building owners and fire departments. Transformers at the INEEL that contained concentrations of PCBs greater than 50 parts per million (ppm) were replaced as of mid-1990. Materials containing PCBs (including those that are under 50 ppm and above 25 ppm) are disposed at EPA-approved sites.

4.2.3.5 Management of Storage Tanks. Management of INEEL storage tanks is performed in accordance with LMITCO MCP-456. This procedure applies to installation, management, operation, record-keeping, and closure of storage tanks. A storage tank is defined as, "a stationary device designed to contain an accumulation of a regulated substance and constructed of non-earthen materials (such as concrete, steel, or plastic that provide structural support, including all ancillary piping."

This procedure does not apply to

- Septic tanks
- Storm-water or waste water collection systems
- Flow-through process tanks
- Any tank system with a capacity of 110 gallons or less
- Any tank system that contains a de minimus concentration of regulated substances
- Any emergency spill or overfill containment system that is expeditiously emptied after use
- Any tank containing a regulated substance that is not in a liquid state at standard pressure and temperature
- Any tank holding hazardous waste listed or identified under Subtitle C of the Solid Waste Disposal Act, or a mixture of such hazardous waste and other regulated substances
- Any wastewater treatment tank system that is part of a waste water treatment facility regulated under Section 402 or 307(b) of the Clean Water Act
- Equipment or machinery that contains regulated substances for operational purposes such as hydraulic lift tanks and electrical equipment tanks
- Surface impoundments, pits, ponds, and lagoons.

4.3 Nature and Extent of Contamination in Groundwater At WAG 4

The purpose of this section is to evaluate groundwater data collected from wells in the vicinity of CFA and, if possible determine the source(s) of groundwater contaminants at CFA. The contaminants which are analyzed are those COPCs identified in the "Work Plan (McCormick, et al., 1997). These COPCs were identified using aquifer and perched water sample data, and maximum potential risk posed by sufficiently mobile soil contaminants. The COPCs include 15 nonradionuclides and 11 radionuclides (Table 4-1).

4.3.1 Aquifer Monitoring Wells

Most of the SRPA wells in the vicinity of the CFA were installed and are sampled annually. Several additional groundwater wells, predominately at the INEEL landfills, were installed and are sampled quarterly as part of the Post-ROD monitoring for the OU 4-12 landfills. Figure 4-29 illustrates the location of 41 groundwater wells from which monitoring data was obtained.

4.3.1.1 Aquifer Water Levels. The potentiometric surface of the Snake River Plain aquifer in the vicinity of the INEEL is depicted in Figure 4-30. This figure is illustrated using 5 ft contour intervals and water levels collected during October 1996. These water levels were collected from 38 monitoring wells located in the central and southern portion of the INEEL. The regional flow or gradient of the aquifer is perpendicular to the equipotential lines. The regional flow is to the south-southwest, although, locally, the direction of groundwater flow is affected by recharge from rivers and inhomogeneities in the aquifer. Across the INEEL, the average gradient of the water table is approximately 4–5 ft/mile.

The direction of groundwater movement in the vicinity of CFA is illustrated in Figure 4-31. This figure was constructed using the same data as Figure 4-30, however, 1 ft contour intervals are used to aid in depicting local flow directions. It is apparent from the groundwater elevation contour map (Figure 4-31) that at a smaller contour interval appears to illustrate the complexity of the water table surface of the Snake River Plain aquifer. This complexity noted at the smaller scale, is due to the variety and degree of interconnection of the water bearing zones that affect the water table at a smaller scale but tend to average out on a larger scale. However, it is apparent from these figures (4-30 and 4-31) and contaminant concentration diagrams that groundwater at/near the INTEC area flows in the south south-westerly direction toward CFA and RWMC. Therefore, contaminants injected or leached into the groundwater at/near INTEC potentially influence the concentration of contaminants detected in the groundwater at CFA.

4.3.1.2 Groundwater Data. A search was conducted of the USGS and the Environmental Restoration Information Services (ERIS) databases for the analytical data related to the COPCs. The search revealed that wells within the vicinity of CFA are analyzed for 21 of the 26 COPCs. Data for many of these COPCs were collected in the past, are not presently being monitored. This information is presented in Table 4-2, which lists the COPCs that are/were monitored and the number of wells that are/were sampled for each constituent.

The data from the 21 COPCs were tabulated to illustrate the number of positive detections and concentrations, number of nondetects, and overall sampling period for each well. These data are presented in Appendix G, Tables G-1 through G-22.

Table 4-1. COPCs identified at CFA groundwater wells.

Wells/Hydraulic Location	Screened Interval	Pump Depth	COPC
CFA-1/upgradient	444-639	NA	1,2-Dichloroethane
CFA-2/downgradient	521-651	NA	Aroclor-1254
LF2-08/downgradient	485-495	NA	Aroclor-1260
LF2-09/downgradient	469-497	NA	Arsenic
LF2-10/downgradient	725-765	NA	Benzaldehyde
LF2-11/upgradient	466-499	NA	Beryllium
LF2-12/downgradient	470-492	481	Cadmium
LF3-08/downgradient	500-510	NA	Chloromethane
LF3-09/downgradient	480-500	493	Chromium
LF3-10/downgradient	481-501	494	Mercury
LF3-11/upgradient	472-492	485	Phenol
CFA-MON-A-001/ downgradient	488-518	512	TPH-gasoline
CFA-MON-A-002/ downgradient	488-518	512	TPH-diesel
CRA-MON-A-003/ downgradient	491-511	494	Trichloroethen
USGS 85/upgradient	522-614	522	Zinc
USGS 104/downgradient	550-700	598	Am-241
USGS 103/downgradient	575-760	615	Cs-137
USGS 106/downgradient	400-760	585	H-3
USGS 108/downgradient	400-760	637	I-129
USGS 105/downgradient	400-800	700	Pu-238
M7S/downgradient	598-628	621	Pu-239
USGS 34/upgradient	500-578	522	Pu-240
USGS 39/upgradient	NA	490	Sr-90
USGS 3/upgradient	689-740	NA	U-234
USGS 36/upgradient	430-567	523	U-235
USGS 37/upgradient	507-571	509	U-238
USGS 38/upgradient	678-729	523	
USGS 111/upgradient	442-600	509	
USGS 112/upgradient	430-563	509	
USGS 113/upgradient	443-561	509	
USGS 077/upgradient	470-586	503	
USGS 114/upgradient	440-560	509	
USGS 115/upgradient	437-580	509	
USGS 116/upgradient	401-572	509	
USGS 020/upgradient	515-552	523	
SPERT-DISP-3/cross gradient	100-225	NA	
STF-MON-A02A/cross gradient	510-530	523	
STF-PIE-A02A/cross gradient	NA	NA	
SITE-09/cross gradient	1000-1140	523	
ORME/cross gradient	NA	NA	
STF-MON-A01A/cross gradient	NA	NA	
Badging Facility Well/cross gradient	NA	NA	
EOCR Production Well/cross gradient	1052-1237	NA	
EOCR Injection Well/cross gradient	NA	NA	

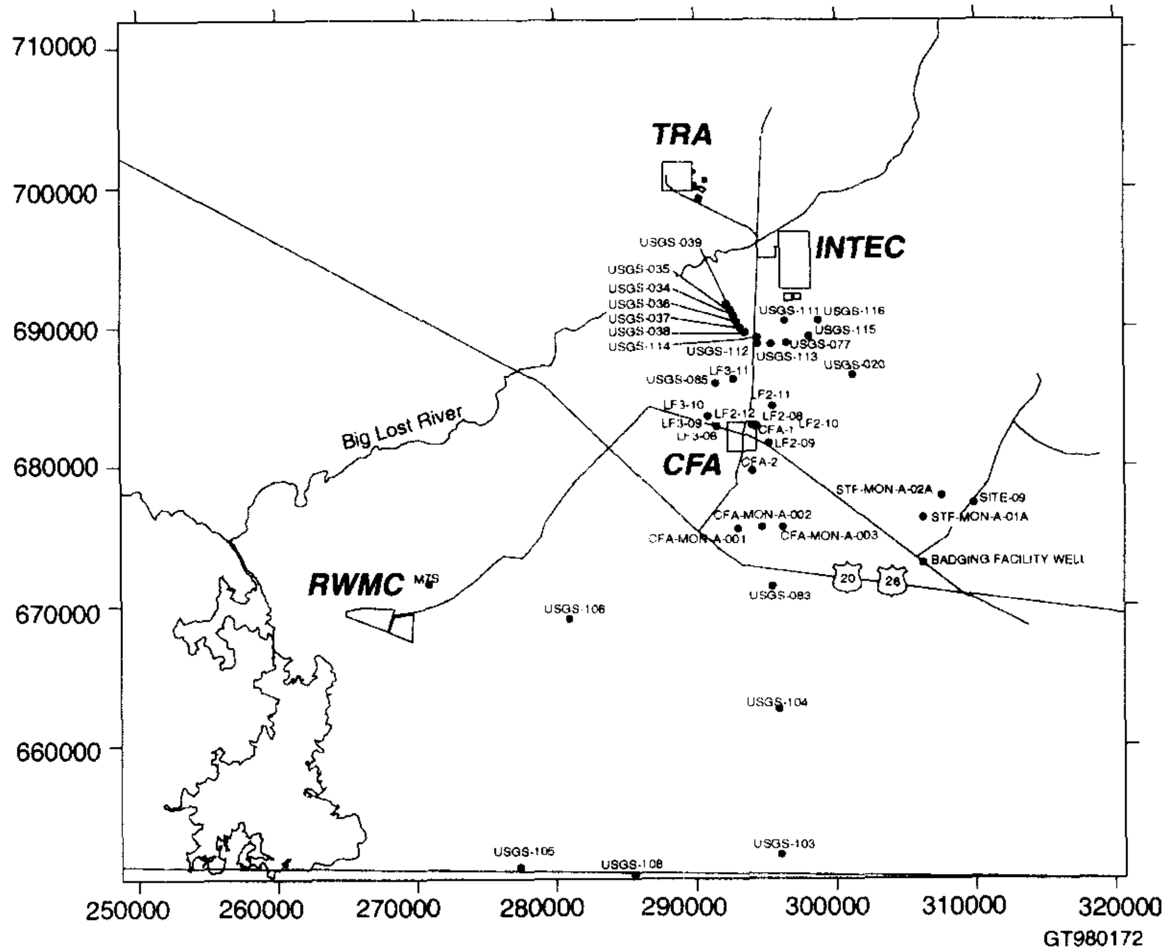


Figure 4-29. Location of groundwater monitoring wells in the vicinity of CFA.

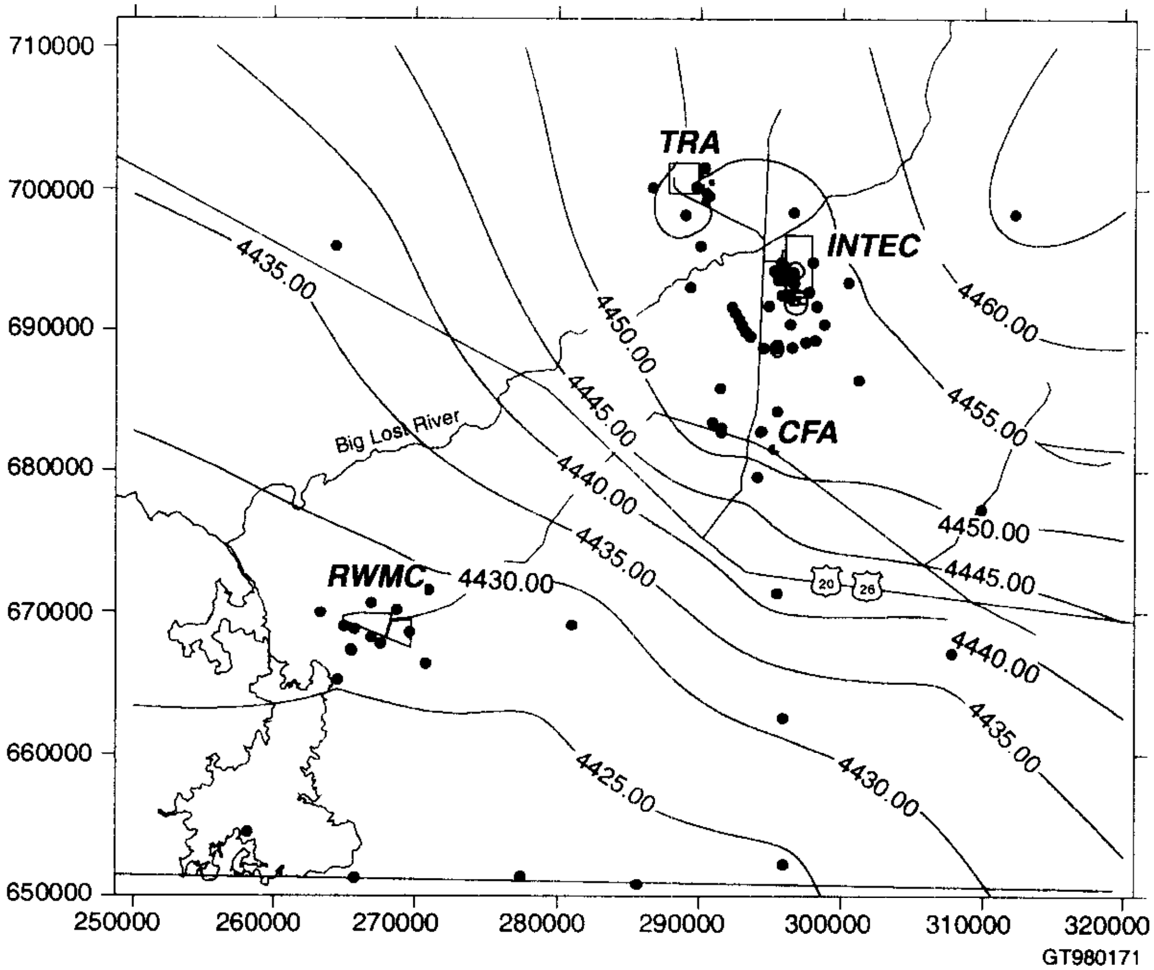


Figure 4-30. October 1996 potentiometric surface of the Snake River plain aquifer near CFA, using 5 ft contour intervals.

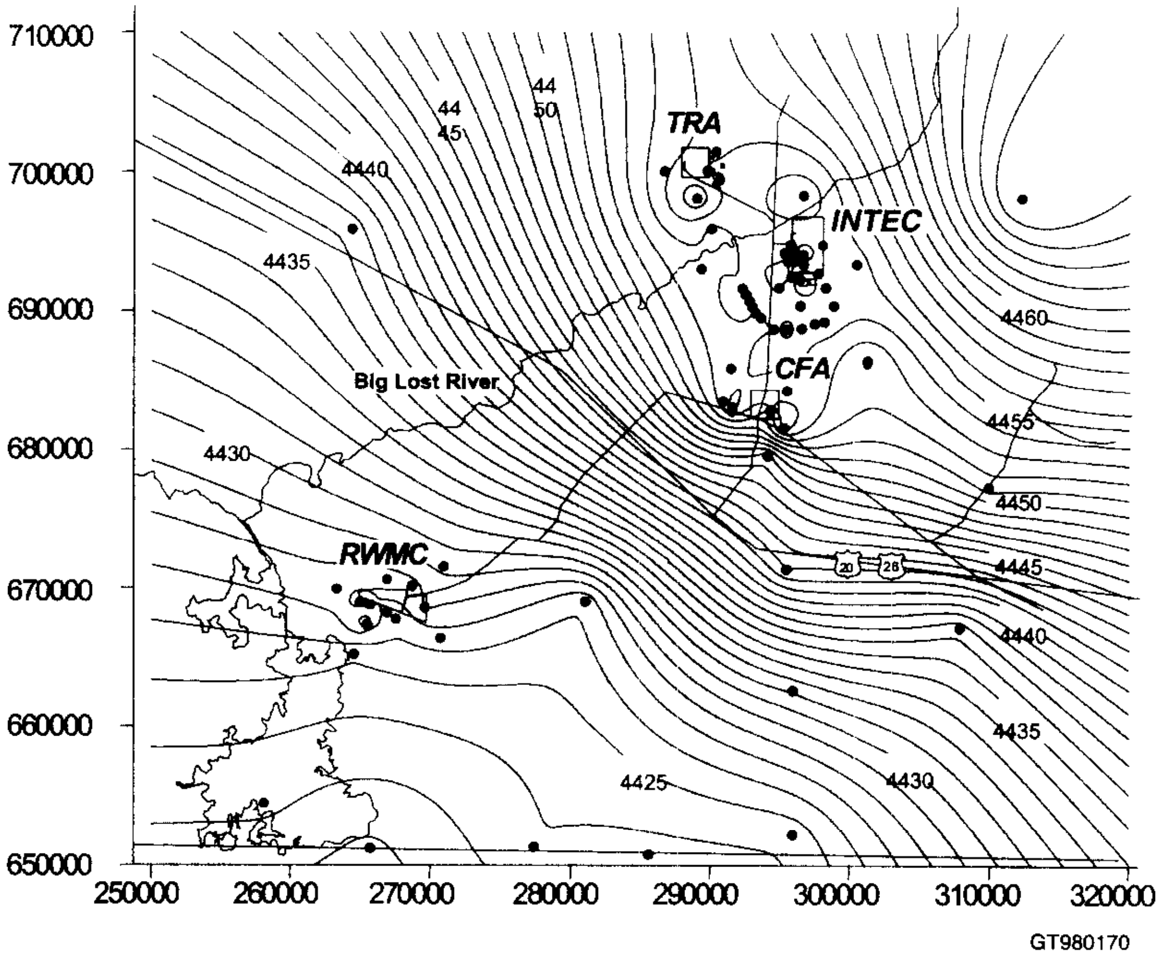


Figure 4-31. October 1996 potentiometric surface of the Snake River plain aquifer near CFA, using 1 ft contour intervals.